

Beyond Tables, Templates, and Checklists: Logistical Art

**A Monograph
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ABSTRACT

BEYOND TABLES, TEMPLATES, AND CHECKLISTS: LOGISTICAL ART by Major Jason J.F. Murphy, U.S. Army, 59 pages.

This monograph reminds us that logistics is both an art and a science. Focusing on a case study of Operation Enduring Freedom (OEF) operations in Afghanistan during 2006 and 2007, it shows the need for including art into the preparation of the logistician for future operational challenges. The argument is organized in five sections. Section one examines logistics theory and looks at why there is a perception that logistics is only a science. Section two discusses how logistics theory is used in military education and training and explains why logisticians are encouraged to think of logistics as a science. Section three describes the friction (mission variables, problems, obstacles, etc.) that was part of the strategic and operational Ground Line of Communications (GLOC) into and out of OEF Afghanistan during 2006/2007. Section four explains the application of art to the mission variables described in section three and how art had to be applied to reduce that friction and create a more responsive logistics pipeline into and out of Afghanistan. Section five concludes with explanations of the need for art in theory, education, and training of leaders/logisticians to meet the demands of the operational environment now and in the future.

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INTRODUCTION

Logistics will continue to set the operational limits of campaigns and will determine what combat units can achieve, where and when they can operate and for what length of time.¹

-Military Technology, *Future Logistics Themes*

In a tale of war the reader's mind is filled with the fighting. The battle . . . excites imagination and commands attention . . . The long trailing line of communications is unnoticed . . . Victory is the beautiful, bright-colored flower. Transport is the stem without which it could never have blossomed. Yet even the military student, in his zeal to master the fascinating combinations of the actual conflict, often forgets the far more intricate complications of supply . . .²

- Winston S. Churchill, *The River War*

These quotes written 105 years apart speak to the enduring importance of logistics.

Today the challenge of providing logistics is greater than ever. Joint Publication 3-0, *Joint Operations*, describes the operational environment today and in the future as composed of “conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander”.³ Army Field Manual 3-0, *Operations*, adds “[the operational environment also includes] an understanding of the physical environment, the state of governance, technology, local resources, and the culture of the local population”.⁴ During the 2008 Association of the United States Army Eisenhower Luncheon General Casey stated, “. . . we believe that we are at war with a global terrorist network, and that the emerging global trends will only exacerbate that struggle, and . . . will lead us to a period of what I call persistent conflict.”⁵ This complex operational environment will create unprecedented demands on the logistics system. The nature of those demands, many of which have already occurred in Afghanistan, require a logistical approach that extends beyond the boundaries of what has been called the

¹ Military and Government Collection. “2007 Future Logistics Themes.” *Military Technology* 31, no.7: 66-66. Database online. Military & Government Collection, EBSCO host; Accessed January 22, 2009.

² Winston S. Churchill, *The River War: An Account of the Reconquest of the Soudan* (New York: Carroll and Graf Publishers, 2000 (originally published 1902), 162-163.

³ Joint Publication 3-0, *Joint Operations* (Washington D.C.: 13 February 2008), II-20-21.

⁴ Department of the Army Field Manual 3-0, *Operations* (Washington D.C.: February 2008), 1-1.

⁵ General George W. Casey, Jr. Association of the United States Army Eisenhower Luncheon Speech (October 7, 2008)

science of logistics. Beyond the tables, templates, and checklists that make up the science of logistics are political, military, economic, social, informational, and infrastructure systems⁶ populated by people categorized as enemies, adversaries, supporters, and neutrals.⁷ These people are each influenced differently by factors of geography, culture, religion, language, history, education, beliefs, perceived objectives and motivations, media, and personal experience.⁸ To function effectively in an environment shaped by so many different influences, the logistician must be able to think creatively. In doing so, the logistician must move beyond science to art.

The problem faced by logisticians as they deal with interconnected systems, the operational environment, human terrain, and the factors that influence human terrain can be viewed as Clausewitzian “friction.”⁹ Clausewitz noted that all operations unavoidably encounter friction because of interactions, connections, and relationships between systems, the operational environment, and chance. Clausewitz stated that commanders must accept the existence of friction even as they work to reduce it. Operational environments like Afghanistan prove difficult because the friction that exists cannot be reduced by a few simple calculations or acceptably solved by lubricating the “logistical machine” with money, raw materials, and lives. To reduce the friction, a non-scientific approach is pursued through creativity, imagination, and innovation. These domains come together to bring forth an environment rich in knowledge, reason, understanding, and wisdom. The result is responsiveness, reduced uncertainty, and the ability of the commander to exploit opportunities. Logistical responsiveness in an underdeveloped, hostile, uncertain environment means leaders need to transcend the customary tables, templates, and checklists of gallons of fuel, meals to eat, and bullets to fire. Leaders must think critically, collaborate, frame, design, plan, implement, continuously learn, and adapt logistical operations

⁶ Joint Publication 3-0, *Joint Operations* (Washington D.C., 13 February 2008), II-23. A system is a functionally related group of elements forming a complex whole.

⁷ Department of the Army Field Manual 3-0, *Operations* (Washington D.C., February 2008), 1-9.

⁸ Department of the Army Field Manual 3-0, *Operations* (Washington D.C., February 2008), 1-9.

⁹ Carl Von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (New York: Everyman's Library, 1993) 120.

amidst ongoing change. It is an enduring requirement for logisticians to be skilled in both the art and science of logistics.

This monograph shows that military doctrine, education and training, and logistical systems reinforce the concept that logistics is only a science. It argues that this approach cannot fully address the logistical situation in complex environments such as Afghanistan and similar future operational environments envisioned in Army doctrine. A case study of Operation Enduring Freedom (OEF) operations in Afghanistan during 2006 and 2007 is used to show the need for including art in the preparation of logisticians and make a case for the view that logistics is both art and science. To assist in describing the focus or aim of logistics education and how that education relates to the problems experienced in Afghanistan, a Logistics Education Training Model is presented in Chapter Two. In the conclusion, variations of this model are used to illustrate the reach of current logistics education and recommendations for adjusting logistics education so that the Army will be better prepared to meet present and future operational challenges.

CHAPTER 1: THE NATURE OF LOGISTICS

MILITARY THEORISTS

For nearly two centuries the ideas and concepts of two military theorists, Carl Von Clausewitz and Antoine Henri Jomini, have been widely incorporated into military doctrine, education and officer professional development. Carl Von Clausewitz, a Prussian general, lived from 1780 to 1831 and fought in the Napoleonic wars. He famously argued that war is “the continuation of policy by other means” in his book *On War*.¹⁰ Antoine Henri Jomini (1779-1869) was a Swiss general who served in the Helvetian Republic, and the French and Russian armies. In *The Art of War*, he stressed the importance of superior numbers, speed, maneuver, and lines of operation and argued that warfare can be reduced to principles that, if practiced, lead to success and victory.¹¹ These theorists differed in their view and approach to warfare, but agreed that logistics is at the pinnacle of warfare and is both an art and a science.

¹⁰ Encyclopedia Highbeam, Highbeam Research Institute, s.v. “Carl Von Clausewitz”; available from <http://www.encyclopedia.com/doc/1E1-Clausewi.html>; Internet; accessed November 18, 2008. “Karl von Clausewitz, 1780-1831, Prussian general and military strategist. Clausewitz was an original thinker most influenced by the Napoleonic wars in which he fought. He served in the Rhine campaigns (1793-94), won the regard of Gerhard von Scharnhorst at the Berlin Military Academy, and served in the wars against Napoleon I. In the service of Russia from 1812 until 1814, he helped negotiate the convention of Tauroggen (1812), which prepared the way for the alliance of Prussia, Russia, and Great Britain against Napoleon. Later he reentered the Prussian army, played an important role at Waterloo, and was appointed (1818) director of the Prussian war college. His masterpiece *On War* was unfinished and was published posthumously. Written in a dialectic style influenced by Hegel and subject to varying interpretations, it remains influential. Clausewitz argued that although most conflicts tend toward total war in the abstract, the “friction” of reality keeps war limited, unpredictable, and dangerous. His most famous dictum, that war “is merely the continuation of policy by other means,” emphasizes his conception of war as one part of normal and pragmatic politics. At the same time, he stressed the need to strive for the most complete military victories possible, using whatever reasonable resources were available. While his work echoes themes from the ancient text *The Art of War*, attributed to Sun Tzu, and even more from the work of Machiavelli, Clausewitz has influenced many 20th-century strategists and historians, especially Bernard Brodie.”

¹¹ Encyclopedia Highbeam, Highbeam Research Institute, s.v. “Antoine Henri Jomini”; available from <http://www.encyclopedia.com/doc/1E1-Jomini-A.html>; Internet; accessed November 18, 2008. “Antoine Henri Jomini, 1779-1869, Swiss general and military writer. He organized (1799) the militia of the Helvetic Republic and after 1804 served as staff officer in the French army. In Aug., 1813, after a clash with Marshal Berthier, he defected to the enemy, joining the Russian army, in which a commission had previously been arranged. He rose to high rank in Russia, becoming a celebrated authority on strategy. His works include a study of the campaigns of Frederick the Great, *Traité des grandes opérations militaires* (5 vol., 1804-10; tr. *Treatise on Grand Military Operations*); *Histoire critique et militaire des guerres de la Révolution* (1819-24), on the French Revolutionary Wars; and the influential *Précis de l'art de la guerre* (1836; tr. *The Art of War*, 1862), which he wrote while military tutor to the future Czar Alexander II.

Carl Von Clausewitz stated “. . . where a state of equilibrium has set in, in which troops move back and forth for years in the same province, subsistence is likely to become the principle concern. In that case, the quartermaster general becomes the supreme commander, and the conduct of war consists of organizing the wagon trains.”¹² Clausewitz discussed the limitation to material factors and supply, as leaders generally desire to reduce logistics down to that which is mathematically calculated.¹³ Logistics has several quantitative aspects that guide the planning into a scientific approach, to include gallons of fuel, tonnage of munitions, number of spare parts, order- and ship-time, and process optimization.¹⁴ Each of these parameters orients logistics toward scientific and mathematical computation. The desire to reduce logistics to mathematical formulas fails to take into account what Clausewitz described as friction in the system: “. . . tremendous friction, which cannot, as in mechanics, be reduced to a few points, is everywhere in contact with chance, and brings about effects that cannot be measured, just because they are largely due to chance.”¹⁵ Chance and friction require logistics operations/management to extend beyond science because they make the operational environment uncertain and volatile and necessitate a creative, imaginative, and flexible approach. According to Clausewitz, you cannot bypass friction in warfare; it is “everywhere in contact with chance”¹⁶. Logistically speaking, friction is the operational variables described by Joint Publication 3-0 and Field Manual 3-0: political, military, economic, social, information and infrastructure systems.¹⁷ Friction’s contacts with chance are natural phenomena (i.e., weather, earthquakes, or solar storms), human terrain,

Jomini emphasized the capture of major points and the importance of superior numbers and lines of operation, and he advocated the employment of speed and maneuver rather than battle whenever possible.”

¹² Carl Von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (New York: Everyman’s Library, 1993), 405.

¹³ Carl Von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (New York: Everyman’s Library, 1993), 137-135.

¹⁴ Moshe Kress, *Operational Logistics, The Art and Science of Sustaining Military Operations* (Massachusetts: Kluwer Academic Publishers, 2002), 9.

¹⁵ Carl Von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (New York: Everyman’s Library, 1993), 129.

¹⁶ Carl Von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (New York: Everyman’s Library, 1993), 120.

¹⁷ Department of the Army Field Manual 3-0, *Operations* (Washington D.C., February 2008), 1-5.

and the human factors that influence the operating environment. The number of variables, actions, reactions, and counteractions that humans create make it impossible to reduce logistics to mathematical calculations and scientific determination. Art is needed.

Antoine Henri Jomini considered logistics difficult because “the term ‘logistics includes all this (duties connected with all the operations of a campaign), the voluminous treaties of the military analysts, all taken together, would hardly give even an incomplete sketch of what logistics is, for it would be nothing more nor less than the science of applying all possible military knowledge.”¹⁸ Jomini understood that logistics extends from the national industrial base to the objective point on the battlefield. This led to the formulation of three logistical principles. First, logistics must be integrated into the commander’s operational plans. Second, the commander must build a logistics system that provides him responsive logistical support from the national industrial base to the objective point on the battlefield. Third, the commander must keep his logistics tempo equal to the pace of maneuvering forces.¹⁹ Jomini warned that ignorance of logistics would lead your Army to peril. “If we retain the term [logistics] we must understand it to be greatly extended and developed in significance so as to embrace not only the duties of ordinary staff officers, but those of generals-in-chief as well.”²⁰ “Strategy decides where to act, logistics brings the troops to this point: grand tactics decides the manner of execution and the employment of troops.”²¹ Logistics comprises the means and arrangements which work out the plans of strategy and tactics. Jomini described logistics as the “practical art of moving armies.”²²

¹⁸ Antoine Henri Jomini, *The Art of War*, edited by Brigadier General J.D. Hittle as a part of *Roots of Strategy Book 2* (Pennsylvania: Stoackpole Books, 1987), 528.

¹⁹ Antoine Henri Jomini, *The Art of War*, edited by Brigadier General J.D. Hittle as a part of *Roots of Strategy Book 2* (Pennsylvania: Stoackpole Books, 1987), 464-465.

²⁰ Antoine Henri Jomini, *The Art of War*, edited by Brigadier General J.D. Hittle as a part of *Roots of Strategy Book 2* (Pennsylvania: Stoackpole Books, 1987), 529.

²¹ Antoine Henri Jomini, *The Art of War*, edited by Brigadier General J.D. Hittle as a part of *Roots of Strategy Book 2* (Pennsylvania: Stoackpole Books, 1987), 460.

²² Antoine Henri Jomini, *The Art of War*, edited by Brigadier General J.D. Hittle as a part of *Roots of Strategy Book 2* (Pennsylvania: Stoackpole Books, 1987), 528.

CURRENT DOCTRINAL DEFINITIONS OF LOGISTICS

The military thoughts of Clausewitz and Jomini are very much a part of U.S. military education, doctrine, and professional development, but despite their recognition of a need for art in logistics practice, U.S. Joint and Army doctrine views logistics as a science. This can be seen by looking at the following Department of Defense joint doctrinal publications: Joint Publications 1, *Doctrine for the Armed Forces of the United States*; 1-0, *Personnel Support to Joint Operations*; 1-02, Department of Defense *Dictionary of Military and Associated Terms*; 2-0, *Joint Intelligence*; 3-0, *Joint Operations*; 4-0, *Joint Logistics*; 5-0, *Joint Operations Planning*; and 6-0, *Joint Communications Systems* and Army field manuals (FM) 3-0, *Operations*; 4-0, *Combat Service Support*; and 5-0, *Army Planning and Orders Production*. Table 1, Doctrinal Definitions and Descriptions, provides a comparison of the definitions and descriptions of logistics, sustainment, and combat service support (CSS). It is important to note that the doctrine often confuses or fails to distinguish between logistics, sustainment, and combat service support. Although closely related, the three deal with specific levels of war and operations and should not be used interchangeably.

Joint Publication (JP) 1-02, establishes a hierarchy in which logistics is the overarching term that encompasses sustainment and combat service support. As seen in the table, JP 3-0 and 4-0 along with FM 3-0, 4-0, and 5-0 clearly support the logistics is science viewpoint. The definition of combat service support in FM 4-0 is used in lieu of logistics and provides the greatest flexibility, especially at the tactical level of war. These definitions lay the foundation for logistical planning. FM 4-0 provides the scientific guideline that I have practiced as a logistics officer. “CSS planning - Identifies . . . requirements, facilities, and other resources necessary to support the operation; Identifies the capabilities, vulnerabilities, and limitations; Identifies support methods and procedures required to meet the needs of the commander; Identifies vulnerabilities of certain types of systems and forces; Provides coordinating and controlling

onward movement of arriving forces and materiel; Includes reasonably assured joint, contracting, Host Nation Support (HNS), and multinational military sources.”²³ According to JP 4-0, effective planning has taken place if a logistician can anticipate requirements and forecast into the future and further states, “logisticians use the principles of logistics as a guide for analytical thinking when assessing courses of action, plans, or orders”.²⁴ Each of the seven principles listed in JP 4-0 (responsiveness, simplicity, flexibility, economy, attainability, sustainability, and survivability)²⁵ discusses logistics as a machine that must be made to run reliably, efficiently, and economically.²⁶ It is noteworthy that the principle of responsiveness requires value judgment based on the unpredictability of the future and falls outside scientific study or analysis.

²³ Department of the Army Field Manual 3-0, *Operations* (Washington D.C., February 2009), 4-5.

²⁴ Joint Publication 4-0, *Joint Logistics* (Washington D.C., 6 April 2000), III-3.

²⁵ Joint Publication 4-0, *Joint Logistics* (Washington D.C., 6 April 2000), III-3 through III-4 definitions of the principles of logistics –

Responsiveness – characterized by the reliability of support and the speed of response to needs of the joint force.

Simplicity – “defined as a minimum of complexity in logistic operations. Fosters efficiency . . . allows more effective control . . . is a way to reduce the “fog of war” or the friction caused by combat.”

Flexibility – “the ability to improvise and adapt logistic structures and procedures to changing situations, missions, and operational requirements. Flexibility is reflected in how well logistics responds in an environment of unpredictability.”

Economy – “defined as the minimum amount of resources required to deliver a specific outcome. . . . achieved when support is provided using the fewest resources within acceptable levels of risk.”

Attainability – “the assurance that the minimum essential supplies and services required to execute operations will be available.”

Sustainability – “the ability to maintain the necessary level and duration of operational activity to achieve military objectives. Sustainability provides the Joint Forces Command (JFC) with the means to enable freedom of action and extend operational reach.”

Survivability – “the capacity of an organization to prevail in the face of potential threats. Survivability is directly affected by dispersion, design of operational logistical processes and the allocation of forces to protect critical logistic infrastructure.”

²⁶ Joint Publication 4-0, *Joint Logistics* (Washington D.C., 6 April 2000), II-2 and III-3. “Logisticians use the principles of logistics as a guide for analytical thinking when assessing COAs or plans/orders. These principles are not a set of rigid rules, nor do they apply in every situation. They should be applied with creativity, insight and boldness. These principles should guide the joint logisticians during all of the planning steps.”

Logistics	Sustainment	Combat Service Support
JP 1, 1-0, 2-0, 5-0, and 6-0 do not define logistics; the term is used only 45 times throughout the 819 pages of doctrine. ²⁷		
JP 1-02, <i>Dictionary of Military and Associated Terms</i>		
“planning and executing the movement and support of forces. It includes those aspects of military operations that deal with: a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; b. movement, evacuation, and hospitalization of personnel; c. acquisition or construction, maintenance, operation, and disposition of facilities; and d. acquisition or furnishing of services” ²⁸	“the provision of logistics and personnel services required to maintain and prolong operations until successful mission accomplishment” ²⁹	“the essential capabilities, functions, activities, and tasks necessary to sustain all elements of the operating forces in theater at all levels of war. Within the national and theater logistic systems, it includes but is not limited to that support rendered by service forces in ensuring the aspects of supply, maintenance, transportation, health services, and other services required by aviation and ground combat troops to permit those units to accomplish their missions in combat. Combat service support encompasses those activities at all levels of war that produce sustainment to all operating forces on the battlefield. It is also called CSS” ³⁰

²⁷ Joint Publication 1, *Doctrine for the Armed Forces of the United States*, (Washington D.C., 14 May 2007); Joint Publication 1-0, *Personnel Support to Joint Operations* (Washington D.C., 16 October 2006); Joint Publication 2-0, *Joint Intelligence* (Washington D.C., 22 June 2007); Joint Publication 5-0, *Joint Operations Planning* (Washington D.C., 26 December 2006); Joint Publication 6-0, *Joint Communications Systems* (Washington D.C., 20 March 2006). Joint Publication 1, *Doctrine for the Armed Forces of the United States*, does not define logistics, sustainment, or combat service support. Joint Publication 1-0, *Personnel Support to Joint Operation*, does not define logistics, sustainment, or combat service support. The terms are sparse in the publication, 15, 9, and 1 time respectively. Joint Publication 2-0, *Joint Intelligence*, also fails to define logistics or sustainment; logistics is found only three times and sustainment five. The term combat service support cannot be located in the publication. Joint Publication 5-0, *Joint Operations Planning*, does not define logistics. Sustainment is defined the same as JP 3-0, *Operations*, “the provision of logistics and personnel services required to maintain and prolong operations until successful mission accomplishment “. The term combat service support is not found in the publication. Joint Publication 6-0, *Joint Communications Systems*, does not define logistics or sustainment. Each word is rarely used in the publication (12, 4, and 1 time respectively). The term combat service support is not found in the publication.

²⁸ Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington D.C., 30 September 2008), 319.

²⁹ Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington D.C., 30 September 2008), 533.

³⁰ Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington D.C., 30 September 2008), 100.

Logistics	Sustainment	Combat Service Support
JP 3-0, Joint Operations		
“the science of planning, preparing, executing, and assessing the movement and maintenance of forces” ³¹	“the provision of logistics and personnel services necessary to maintain and prolong operations until mission accomplishment” ³²	Not Defined in publication
JP 4-0, Joint Logistics		
“the science of planning and carrying out the movement and maintenance of forces” ³³	“the provision of personnel, logistic, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or the national objective” ³⁴	“the essential capabilities, functions, activities, and tasks necessary to sustain all elements of operating forces in theater at all levels of war” ³⁵
FM 3-0, Operations		
“the science of planning and carrying out the movement and maintenance of forces” ³⁶	Not Defined in publication	Not Defined in publication
FM 4-0, Combat Service Support		
Not Defined in publication	Not Defined in publication	“encompasses those activities at all levels of war that produce sustainment to all operating forces on the battlefield” ³⁷
FM 5-0, Army Planning and Orders Production , does not define logistics but assigns responsibility for logistical analysis to the responsibility of the Assistant Chief of Staff G-4 (S-4). ³⁸		

Table 1. Doctrinal Definitions and Descriptions

³¹ Joint Publication 3-0, *Joint Operations* (Washington D.C., 13 February 2008), III-30.

³² Joint Publication 3-0, *Joint Operations* (Washington D.C., 13 February 2008), III-30.

³³ Joint Publication 4-0, *Joint Logistics* (Washington D.C., 6 April 2000), I-1.

³⁴ Joint Publication 4-0, *Joint Logistics* (Washington D.C., 6 April 2000), I-16.

³⁵ Joint Publication 4-0, *Joint Logistics* (Washington D.C., 6 April 2000), GL-5.

³⁶ Joint Publication 4-0, *Joint Logistics* (Washington D.C., 6 April 2000), I-1.

³⁷ Department of the Army Field Manual 4-0, *Combat Service Support* (Washington D.C., August 2003), 1-1.

³⁸ Department of the Army Field Manual 5-0, *Army Planning and Orders Production* (Washington D.C., January 2005), C-3. “mission analysis on all matters concerning logistic operations, supply, maintenance, transportation, and services.”

LOGISTICS SYSTEMS

Nowhere is the concept of logistics as a science more visible than in the use of systems by logisticians to plan and execute logistics. Logisticians use systems such as Operations Logistics Planner (OPLOG Planner)³⁹, Logistics Estimation Workbook (LEW), Food and Water Planner, Class IV Construction Estimator, Class IV Construction Tool, Class IV Barrier-Fortification Estimator, Platform Estimator, and Movement Calculator to plan for operations. Logisticians use Integrated Booking System (IBS), Global Freight Management (GFM), Global Air Transportation Execution System (GATES), Pipeline Asset Tool (PAT), World Port System (WPS), and a plethora of in-transit visibility systems to execute plans. All systems are computer based and designed to remove uncertainty from the environment and create logistical conditions that ensure the commander can execute the mission when, where, and how he or she desires.

In his article “The LEW: It Keeps Getting Better”, Captain Ballinger stated that Logistics Estimation Workbook is an “important part of their mission analysis and logistics planning.”⁴⁰ He conveyed a sense of better logistics when computer computation programs such as LEW are used and how their continued improvement meets the challenges faced by logisticians. Another logistician, Major John Hall, studied how well the supply effort for Operation Enduring Freedom was working and stated that “pipeline (flow of supplies coming into Afghanistan via ground and air) performance is described in terms of overall mean requisition

³⁹ United State Army Combined Arms Support Command, Force Development Directorate, Planning Data Branch, OPLOG Planner “Operational Logistics Planner.” Available from <https://www.cascom.army.mil/private/CDI/FDD/Multi/PDB/OPLOGPlanner.HTM>. Internet; accessed on 29 January 2009. OPLOGPLN 7.0 is designed to assist logistics planners in calculating supply usage estimates in support of operations. They are designed specifically to support operations typically associated with multi-phase operation plans (OPLAN) and operation orders (OPORD). The user creates UNITS based on standard Tables of Organization and Equipment (TOE) (BASE, NOT MTOEs) and maps these units into TASK ORGANIZATIONS. The TASK ORGANIZATIONS can then be assigned to a multi-phase ORDER and assigned user-developed MISSION PARAMETER SETS (which essentially describe the conditions under which the TASK ORGANIZATION operates). Reports then provide supply consumption by UNIT, by TASK ORGANIZATION, by PHASE, and by ORDER.

⁴⁰ Carl E. Ballinger, “The LEW: It Keeps Getting Better,” *Army Logistician* Volume 37, Issue 4 (July – August 2005): 43.

wait times and mean processing times for four major pipeline segments”.⁴¹ Here again, the logistical system is examined as a machine and its performance based on time. However, the synchronization of logistics into the overall strategy and across the levels of war is what will produce the freedom of maneuver the commander desires.

THE CASE FOR LOGISTICS AS SCIENCE

An examination of the words logistics and science shows why logistics is usually seen as a science. The root of the word logistics dates back to the Greek adjective *logistikos* meaning *skilled in calculating*. Later, in Roman and Byzantine times a military administrative title *Logista* surfaced for use when referring to a skilled mathematician.⁴² Science is defined as “knowledge of facts, phenomena, laws, and proximate causes, gained and verified by exact observation, organized experiment, and ordered thinking.”⁴³ Science, in other words, is about having an organized knowledge of the properties of matter and an understanding of the interrelationships between different parts of the material world (for example, the relationship between fodder and horses or between gasoline and internal combustion engines). The value of tying mathematical calculations to this process of organized analysis is obvious. As the army entered the industrial age of mass personnel and machines, the need to calculate and plan for enormous material consumption gave birth to logistical science.⁴⁴

The industrialization of warfare and evolution of Operations Research and computer technology gave rise to the application of quantitative methods and algorithms to meet the commander’s plan.⁴⁵ Logistics planners and operators work to systematize data and information

⁴¹ John Hall, “Afghan Supply Pipeline Performance,” *Army Logistician* Volume 35, Issue 1 (January – February 2003): 4.

⁴² James A. Hutson, *The Sinews of War* (Washington: United States Army Center of Military History, 1988). 692.

⁴³ Funk and Wagnalls Encyclopedia College Dictionary, s.v. “science” (New York: Funk and Wagnalls, 1968), 1203.

⁴⁴ James C. Johnson and Donald R. Wood, *Contemporary Logistics* (New York: MacMillan Publishing Company, 1990). 6.

⁴⁵ Moshe Kress, *Operational Logistics: The Art and Science of Sustaining Military Operations* (New York: Springer, 2002), 8.

to gain knowledge about the capability to execute or the limitations to be placed on an operation. Logistics is approached scientifically because of the heavy reliance on quantitative computations of factual requirements (pounds of materials, gallons of fuel, pounds of munitions, number of Soldiers), mechanical capabilities (number of pallets, number of trucks, planes, trains), and information [Total Asset Visibility (TAV), In-transit visibility (ITV), Just-In-Time (JIT) logistics]. As stated by Dr. Alan Chalmers, a leading scholar in the philosophy of science, “Science is special because it is based on the facts, the facts are presumed to be claims about the world that can be directly established by a careful, unprejudiced use of the senses. Science is to be based on what we can see, hear and touch rather than on personal opinions or speculative imaginings.”⁴⁶

In accord with Dr. Chalmer’s view of science, logisticians do not habitually look for creative, intuitive, or imaginative approaches or employ improvisation. They focus on linear mathematical models of comparative study (requirements, capabilities, limitations) and restrict themselves to material, personnel, and services. However, there are imponderable human factors in war that cannot be seen, heard, or touched, but must be considered. According to Martin L. Van Creveld, they are not amenable to calculation:

When the chips are down, there is no ‘rational’ calculation in the world capable of causing the individual to lay down his life. On both the individual and collective levels, war is therefore primarily an affair of the heart. It is dominated by such irrational factors as resolution and courage, honor and duty, and loyalty and sacrifice of self. When everything is said and done, none of these has anything to do with technology, whether primitive or sophisticated. So it was at a time when war was limited to face to face clashes between hide-clad, club-armed caveman, 50,000 years ago; so it will be when laser-firing flying saucers permit it to be fought over interplanetary distances 100, or 500, or 1,000 years hence.⁴⁷

In summary, our doctrine runs contrary to the views of military theorists by defining logistics as science and is further reinforced by systems that reduce logistics to mere calculations.

⁴⁶ Alan Chalmers, *What is this thing called Science* (Australia: University of Queensland Press, 1999), 1.

⁴⁷ Martin L. Van Creveld, *Technology and War* (New York: The Free Press, 1991), 314.

CHAPTER 2: LOGISTICS EDUCATION AND TRAINING

INSTITUTIONAL LOGISTICS EDUCATION AND TRAINING

The education and training of U.S. Army logisticians further promotes the concept that logistics is a science rooted in mathematical calculations. Logistics Corps (LG) Officers begin their careers or service in a basic branch of ordnance, quartermaster, or transportation where their education is heavily focused on branch specifics and the learning of Army regulations, leadership, and technical and tactical skills.⁴⁸ It is after completing the Combined Logistics Captains Career Course (LG CCC) that officers are combined into one unified branch of Logistics. The LG CCC prepares officers to command Soldiers at the company level and to serve as staff officers at the battalion and brigade level. Formal education continues to focus on technical, tactical, and leadership competencies.⁴⁹ After successfully serving as a company commander and staff officer, officers are promoted to the rank of major and attend Intermediate Level Education (ILE). ILE is grounded in warfighting doctrine and formatted to prepare new field-grade officers for the next ten years of service.⁵⁰ Graduates are expected to have the technical, tactical, and leadership competencies to be successful at higher levels of responsibility and authority.

These three institutional education systems (basic, captain's career course, and the intermediate level education), emphasize learning doctrine and the science of logistics. This intense scientific/mathematical approach creates a frame of reference in which logisticians are the equivalent of a cog in a machine and builds a false expectation that they will operate within this closed system. For example, the Support Operations Phase II course [a course mandated for all logisticians at the Command and General Staff College (CGSC) ILE course] describes nine

⁴⁸ Department of the Army Pamphlet 600-3, Commissioned Officer Professional Development and Career Management (Washington D.C, 11 December 2007). 8

⁴⁹ Department of the Army Pamphlet 600-3, Commissioned Officer Professional Development and Career Management (Washington D.C, 11 December 2007). 8.

⁵⁰ Department of the Army Pamphlet 600-3, Commissioned Officer Professional Development and Career Management (Washington D.C, 11 December 2007). 8.

different Standard Army Management Information Systems (STAMIS) and expects students to comprehend their function, location, maintenance, and management. In addition to this emphasis on systems, the Logistics Branch also expects LG officers to have the ability to deal with matters beyond simple problems of supply: “LG officers are effective in managing, leading, and changing large organizations. They are skilled in governance, statesmanship, and diplomacy. A logistician understands cultural context and works effectively across it.”⁵¹ Such a requirement is outside the scope of doctrine and science. If this is in fact a primary goal, then the education of officers must address art as well as science.

THE LOGISTICS EDUCATION TRAINING MODEL

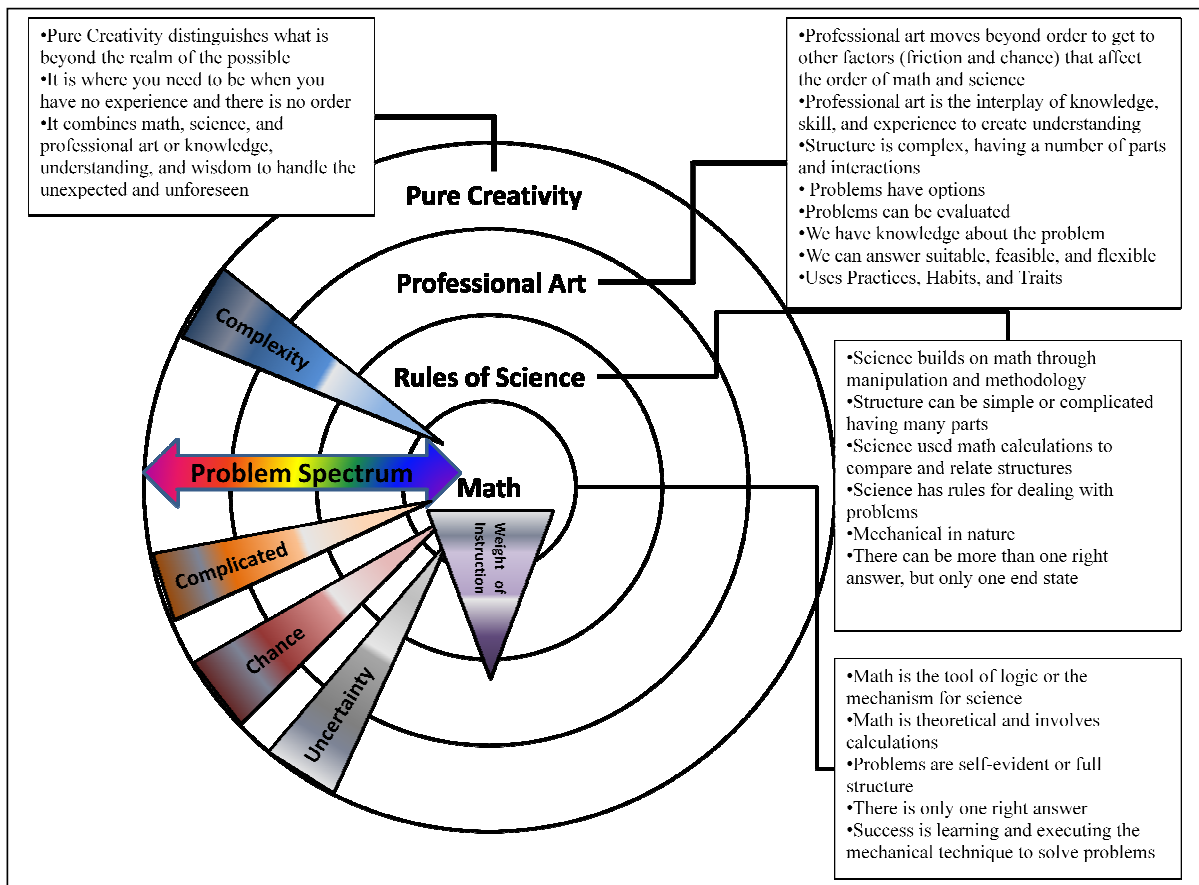


Diagram 2.1 Logistics Education Training Model

⁵¹ Department of the Army Pamphlet 600-3, Commissioned Officer Professional Development and Career Management (Washington D.C, 11 December 2007). 344.

Diagram 2.1, the Logistics Education Training Model, illustrates the various types of logistics challenges that exist and the relationship between science and art in solving them. It also depicts how the Army's current logistics education program may not be fully preparing logisticians to meet some current and future operational requirements.

The central feature of the model is the four rings labeled mathematics, the rules of science, professional art, and pure creativity. These terms represent the four capabilities that are used to solve logistics problems. Conversely, they also represent four different kinds of logistics problems in order of complexity, with those amenable to simple mathematical solutions being the least complex, and those requiring pure creativity being the most complicated. The full range of possible logistical problems is depicted by a double-headed arrow titled Problem Spectrum that extends from the mathematics rings through the rules of science and professional art rings out to the pure creativity ring. Also in the model are four triangles with vertices in the mathematics ring and broader bases in the ring of pure creativity. They illustrate the different levels of complexity, chance, uncertainty, and complicatedness in problems along the problem spectrum. A problem requiring the display of creativity will be in an environment that possesses all of these qualities in abundance, as opposed to a straightforward problem that can be solved quickly by mathematical calculation.

The remaining triangle (the shortest of all), with the broad base in the mathematics ring and the vertex that is located just beyond the rules of science ring inside the professional art ring, represents the focus of current logistics education. As discussed in the previous section, the weight of the Army's institutional education in logistics falls almost exclusively within the mathematics and rules of science rings despite the words of theory and the needs shown by actual practice. The result has been a gap between preparation and the problem solving capabilities required of logistician in the field. Currently, the education of logisticians makes it difficult for

many of them to move beyond the technical aspects of logistics and solve problems creatively.

This makes their situation uncomfortable and often constrains their commanders.

CONTEMPORARY OPERATING ENVIRONMENT LOGISTICS PLANNING

The planning of logistics in the contemporary operating environment is best described in JP 5-0, “The purpose of support planning is to determine the sequence of personnel, logistic, and other support required to provide distribution, maintenance, civil engineering, medical support, and sustainment in accordance with the concept of operation. Support planning is conducted in parallel with other planning . . .”⁵² The statement of sequencing quantifies logistics and places it in a time continuum to be algorithmically executed. Logistics planners are taught to think scientifically in terms of equations such as requirements versus capabilities; in arithmetic terms such as calculating the amount of supplies, gallons of fuel, and trucks required; and in time using movement tables, supply rates, and transit time. The condition is created in which the logistics planner can keep pace with the maneuver planner. That is, logistics and maneuver are planned concurrently allowing the logistics planner to know what the maneuver planner will need and work out how it will be provided beforehand.

During the key steps in mission analysis (studying ourselves in terms of facts, status, or conditions), the science of logistics works extremely well. The level of knowledge about ourselves is derived from the facts based on our rational operation as an Army. The facts come from our validated observations and descriptions about the world based on what we see, hear and touch. The science begins to fall apart when assumptions are assembled to support the planning process and planning guidance.⁵³ A valid assumption must be “logical, realistic, and essential...”⁵⁴; a difficult task when developing assumptions for uncertain environments with

⁵² Joint Publication 5-0, *Joint Operations Planning* (Washington D.C., 26 December 2006), III-44.

⁵³ Joint Publication 5-0, *Joint Operations Planning* (Washington D.C., 26 December 2006), III-26.

⁵⁴ Joint Publication 5-0, *Joint Operations Planning* (Washington D.C., 26 December 2006), III-26

transnational challenges. There is no single mathematical process that accurately takes into account all mission variables and human terrain circumstances.

LOGISTICS MODELING

Major David Gibson, in an *Army Logistician* article, provides an eight-step process to improve process capabilities, shorten throughput times, improve quality, and cut costs⁵⁵ similar to a manufacturing production line that requires management and not leadership. Gibson's production-line management is not new; looking to private industry and business to streamline processes, reduce order-to-ship time, and improve predictability is good practice. Iain Galloway's article in *Logistics Information Management* outlined the business case for improving military logistics and its systems through cost control, budgeting, and best value.⁵⁶ In his approach, controlling the money controls the logistics. A review of the Army's enterprise system by Peter Bacque of the *Richmond Times - Dispatch* stated we are to use the best practices of commercial industry and borrow from private industry to control logistics operations.⁵⁷ The *Atlantic Monthly* pointed out that in the downsizing of the military following the Cold War, "many support jobs were outsourced to the private sector in an effort both to save money and make remaining personnel available for combat positions".⁵⁸ This has led industry to work logistical operations in the Army to meet profit and shareholder needs. In the end, the problem remains that there is no business that does everything the U.S. Army does at the scale the U.S. Army does it.

⁵⁵ David R. Gibson, "An Eight-Step Process for Improving Logistics Activities", *Army Logistician* Volume 37, Issue 5 (September – October 2005), 30.

⁵⁶ Iain Galloway, "Design for Support and Support the Design: Integrated Logistics Support – The Business Case," *Logistics Information Management* Volume 9, number 1 (January 1, 1996), 24-31. Available at <http://www.proquest.com.lumen.cgsccarl.com/>. Accessed January 22, 2009.

⁵⁷ Peter Bacque "From Manufacturing to Foxhole' / Army's Streamlined system for logistical Operations discussed at Symposium" *Richmond Times – Dispatch*, May 15, 2008, <http://www.proquest.com.lumen.cgsccarl.com/> (accessed January 22, 2009)

⁵⁸ "U.S. Military Logistics." *The Atlantic Monthly*, May 1, 2003, 50-51. <http://www.proquest.com.lumen.cgsccarl.com> (accessed January 22, 2009).

Modeling our logistics systems after private industry implies that we have full and total control over our logistics business. With a Department of Defense logistics budget of about \$250 billion, politics comes into play.⁵⁹ It is no secret that defense contracts are big money and can make or break companies. These companies employ communities and these communities have legislators. Legislators want the best for their constituents and therefore logistics becomes political. The politics of logistics comes to the forefront through rules, regulations, and the Federal Code. Factors beyond our control constrain logistics to a point of chaos. This is not to say logistics modeling has no value. Modeling assists in decomposing the complicated components and improving their optimization. In the case of complex components, we must look to art for optimization unconstrained by scientific measures of performance. Too much attention is paid to educating, training, and indoctrinating logistics officers to model operations after private industry without understanding the limitations of private industry models.

In summary, institutional logistics education and training is weighted heavily in mathematics and rules of science. The Contemporary Operating Environment (COE) of logistics planning is conducted using equations (requirements vs. capabilities), arithmetic (gallons of fuel, number of meals, pounds of supplies), and time (movement tables). This can be traced to the desire to model military logistics after industry and apply the practices across the board without regard to the uniqueness of the military and its mission. Consequently, officers do not receive training that allows them to employ “professional art” or “pure creativity”.

⁵⁹ Peter Bacque “‘From Manufacturing to Foxhole’ / Army’s Streamlined system for logistical Operations discussed at Symposium” *Richmond Times – Dispatch*, May 15, 2008, <http://www.proquest.com.lumen.cgscarl.com/> (accessed January 22, 2009)

CHAPTER 3: A CASE STUDY OF LOGISTICS IN OPERATION ENDURING FREEDOM IV

The logistics is a science mindset as demonstrated in U.S. Army doctrine, logistics systems, and education and training of logisticians is being tested by today's operational environments. This chapter examines recent events in Afghanistan and presents a case study of Operation Enduring Freedom (OEF) operations during the period from March 2006 to February 2007. It describes the problems encountered by logisticians working the strategic and operational Ground Lines of Communications (GLOC) into and out of the Afghanistan Theater. This Theater is a complex environment shaped by tension and friction in physical geography, infrastructure, culture, religion, politics, economics, and security. Events in this Theater demonstrate the constraints of science and argue that art is a necessary component of logistical operations.

My own experiences are a large part of this chapter. I deployed to Afghanistan in February 2006 as an individual augmentee to work with the Joint Logistics Command (JLC) and Combined Joint Task Force 76 (CJTF-76) staff J4 at Bagram Airbase, Afghanistan. As a member of United States Transportation Command's (USTRANSCOM) Military Surface Deployment and Distribution Command (SDDC), I was responsible for coordinating the transport of material and equipment coming into and going out of the Afghanistan Theater via the sea and ground lines of



Figure 3.1 Map of Afghanistan

The Central Intelligence Agency, *The World Factbook - Afghanistan*. Available from: <https://www.cia.gov/library/publications/the-world-factbook/geos/af.html>. Accessed 26 January 2009.

communication. Going in, this appeared to be a simple mission that I was well-trained for, but that was wrong. Carl Von Clausewitz stated once that, “Everything in war is very simple, but the simplest thing is difficult.”⁶⁰ The number of friction points (terrain, infrastructure, culture, religion, FSO, politics, and economics) made the simplest thing, moving cargo, difficult.

PHYSICAL GEOGRAPHY, INFRASTRUCTURE, AND ASSETS

With no seaport, no military transportation assets, no in-transit visibility technology, no interstate highway system, no presence in the neighboring country sea port, no military assets to command or control, no contract control, and so on, Afghanistan poses many extremely difficult problems for those trying to bring what our nation’s strategic national industrial base produces to the tactical forward operating bases of our soldiers. The impact of Afghanistan’s physical geography is a recurring theme in article after article by service members describing their challenges in Afghanistan. In their article “Logistics Challenges in Support of Operation Enduring Freedom”, Majors McDonnell and Novack, both of whom served in the 10th Mountain Division during Operation Enduring Freedom IV, describe challenges with each class of supply, pointing out the inability to overcome mountainous terrain and the deteriorated road network. These friction points were so significant that time-sensitive support or perishable



Figure 3.2 Pakistani Semi-Truck with Maersk Sealand Refrigerator Trailer fallen off the side of the road near the Khyber Pass (Photo by Author)

⁶⁰ Carl Von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (New York: Everyman’s Library, 1993), 119.

supplies had to be transported by air.⁶¹ Major David Cintron's article "MTMC Surface Shipments Sustain Troops in Afghanistan" notes that "routes climb in places to an elevation of 6,000 feet and snowdrifts sometimes blocked tunnel entrances and drifted over roads . . . limited bridge capacity made it impossible to use large, heavy trucks to perform the mission".⁶²

With over two decades of conflict, the limited infrastructure that existed in Afghanistan has been destroyed.⁶³ Afghanistan has approximately 250,000 square miles of land area. Traversing this land mass are currently approximately 7,673 miles of paved roads⁶⁴, less than half of what Afghanistan had prior to the 1979 Soviet invasion.⁶⁵ It is estimated that over 18,000 miles of paved roads would be required to create a *reasonable* commerce environment for the country.⁶⁶ Most roads lack highway



Figure 3.3 Photo of trucks in Khyber Pass
(Photo by Author)

⁶¹ James J. McDonnell and J. Ronald Novack, "Logistics Challenges in Support of Operation Enduring Freedom," *Army Logistician* Volume 36, Issue 5 (September – October 2004), 9.

⁶² David Cintron, "MTMC Surface Shipments Sustain Troops in Afghanistan," *Army Logistician* Volume 34, Issue 5 (September –October 2002), 26.

⁶³ Jane's Information Group - Country Watch Review. "2008 Country Review Afghanistan," Available from [http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed 7 January 2009. 107](http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed%207%20January%202009.107).

⁶⁴ Jane's Information Group – Country Watch Review. 2008 Country Review Afghanistan," Available from [http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed 7 January 2009.](http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed%207%20January%202009.107)

⁶⁵ Jane's Information Group – Country Watch Review. 2008 Country Review Afghanistan," Available from [http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed 7 January 2009.](http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed%207%20January%202009.107)

⁶⁶ Jane's Information Group – Country Watch Review. 2008 Country Review Afghanistan," Available from [http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed 7 January 2009.](http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet;accessed%207%20January%202009.107)

signs, safety equipment such as guardrails, and have no lighting. The Khyber Pass road linking Pakistan and Afghanistan was built in 1879 and curves along for 30 miles. The elevation rises to 3,517 feet with cliffs of 600 to 1,000 feet on the side.⁶⁷ Rail lines are realistically absent except for less than 28 miles of lines the Soviets built coming in from Uzbekistan to help their war effort in the 1980s.⁶⁸ This will remain an unviable means of transportation for some time, since the Afghanistan government has no plans to develop its rail system for ten years.⁶⁹ For the next ten years, the primary infrastructure focus will have to be on roads and airports.⁷⁰ Because Afghanistan is a landlocked country, they have no seaports. This major condition requires Afghanistan to work through the Pakistan seaports of Karachi and Qasim to ship and receive goods from around the world.⁷¹ To get to these ports, Afghanistan has only two roads that cross the border into Pakistan (as shown in Figure 3.3); one in the north through Peshawar and a second through Quetta in the south. These two border-crossing points are controlled by the Pashtun tribes of Pakistan's Federally Administered Tribal Area (FATA).⁷²

The lack of roads, railways, and seaports, and limited points of entry and exit from the country create conditions that cause significant friction trying to move cargo into and out of

⁶⁷ Encyclopedia Encarta, Microsoft® Encarta® Online Encyclopedia 2008, s.v. "Khyber Pass," available from <http://encarta.msn.com>; Internet; accessed 8 January 2009.

⁶⁸ Jane's Information Group – Country Watch Review. *2008 Country Review Afghanistan*," Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current; Internet; accessed 7 January 2009.

⁶⁹ Jane's Information Group – Country Watch Review. *2008 Country Review Afghanistan*," Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current; Internet; accessed 7 January 2009.

⁷⁰ Jane's Information Group – Country Watch Review. *2008 Country Review Afghanistan*," Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current; Internet; accessed 7 January 2009.

⁷¹ Jane's Information Group – Country Watch Review. *2008 Country Review Afghanistan*," Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current; Internet; accessed 7 January 2009.

⁷² Central Intelligence Agency. *"The World Factbook – Pakistan"*; available from <https://www.cia.gov/library/publications/the-world-factbook/geos/pk.htm>; Internet; accessed 7 January 2009.

Afghanistan. Using routes other than Pakistan involve greater overland distances and significant delays resulting from the diplomatic clearances necessary for border crossings, commodity restrictions on what can be shipped (food, water, and fuel were the only commodities permitted to travel overland from Europe to Uzbekistan in 2006), rail gauge changes, and trans-loading requirements. These delays precluded a sustained line of communication overland from Europe in 2006; these problems still exist in 2009.⁷³



Figure 3.4 Map of Pakistan

The Central Intelligence Agency, *The World Factbook - Pakistan*. Available from: <https://www.cia.gov/library/publications/the-world-factbook/geos/pk.html>. Accessed 26 January 2009.

In addition, there is a lack of transportation assets, availability, capacity, and distribution. Transportation assets became a source of friction because of the limited number of trucking companies, trucks, and truck capacity. During 2006, SDDC had essentially three ocean carriers

⁷³ Robert C. Kline, "Logistics Transformation", briefing slides with scripted commentary, Pentagon Department of the Army G-4, 2 December 2002.

(Hagpag Lloyd, Maersk Lines and American Presidents Line) with rates and routes to the Port of Karachi, Pakistan. The ocean carriers were able to find only two trucking organizations to move the cargo to and from the Port of Karachi. Each company had a limited number of trucks and drivers because of the requirement to travel such a great distance (up to 850 miles) and between countries. They also encountered “delayed bridge crossings, avalanches, blizzards, flooded tunnels, one-way traffic alternating daily, and administrative delays”.⁷⁴ In addition, there were only eight lowboy truck-trailer combinations in service to move equipment to and from the port. The friction created by a limited number of trucking organizations and trucks and the restriction the terrain places on the capacity of the trucks further explains why the simplest mission is the most difficult.

Knowing the limitations of and on transportation assets, the distribution of assets becomes critically important. Distribution of transportation of assets is supposed to be accomplished with tracking systems such as Total Asset Visibility (TAV) or In-Transit Visibility (ITV). However, in 2006 the government of Pakistan would not allow the use of these technologies in their country. The use of Radio Frequency Identification Tags (RFID) or tracking devices was perceived by some Pakistani government officials as a type of spy technology. Tracking the movement of their trucks could be used against them if relations broke down. This system would also require the installation of RFID readers in their country and integration into their power grid for long-term use. Our ITV systems were inoperative. There were only two moments in time when we knew where cargo was, when it left the port in Pakistan or base in Afghanistan and when it arrived at its destination in Afghanistan or at the port in Pakistan. According to the Universal Services Contract version five (USC05), under which all cargo going to and from the Theater is moved, trucks were supposed to travel 300 miles per day

⁷⁴ David Cintron, “MTMC Surface Shipments Sustain Troops in Afghanistan,” *Army Logistician* Volume 34, Issue 5 (September–October 2002), 26.

and should take only three days to reach their destination.⁷⁵ Instead, average travel time was 13 days. Therefore, truck assets were tied up on roads for approximately a month in order to make one round trip.

In addition to excessive travel time, security procedures and coordination upon arrival meant trucks took between two and five days to process at the destinations in Afghanistan. In an



Figure 3.5 Pakistani drivers sleeping in marshalling yard near a U.S. base in Afghanistan (Photo by Author)

attempt to eliminate vehicle born improvised explosive device (VBIED)⁷⁶, trucks were required to ‘cool off’⁷⁷ for 24 hours upon arrival. After the cooling off period, trucks had to be hand searched and scanned before gaining entrance to the base. Only so many trucks could be hand searched at a time and competing command requirements for local trucks backlogged the system. Once a truck was cleared

to enter the base, it had to be escorted to and from the receiving yard and shipping yard. The escort was under one contract, the receiving yard under another contract, and the shipping yard was run by the military. Material-handling equipment (MHE) was coordinated by another contractor and was not always on station to load or unload the trucks. This quagmire of interactions caused significant friction and greatly delayed the processing of trucks into and out of the bases. Assets were spread out all over the theater with choke points causing a build-up of assets and making it impossible to maintain a steady flow of materials. Collectively, these

⁷⁵ Military Surface Deployment and Distribution Command. “Universal Services Contract 05”; available from <http://www.sddc.army.mil/sddc/Content/Pub/38059/USC05%20Contract.pdf>; Internet; accessed 8 January 2009, 36.

⁷⁶ A vehicle improvised explosive device (VBIED) is a vehicle laden with explosives, set to explode by remote control or by a passenger/driver.

⁷⁷ A ‘cool off’ period was a variable time period set by base security in which the truck had to be turned off in a staging area adjacent to the base and kept under the surveillance of base security. The truck still sat outside the base.

constraints meant that mathematical calculations and scientific formulations could never describe or predict when and how the mission would be accomplished.

CULTURE AND RELIGION

Clausewitz's maxim about the simplest things being difficult in war is also culturally and religiously relevant. Literacy and time were the most prominent cultural obstacles.

Afghanistan's location has given rise to an ethnically and linguistically diverse people; it has 45 living languages (the two primary being Pashtu and Dari) and is composed of 60 clans.⁷⁸ The linguistic diversity and various clans disrupt unity and standardization. In addition, Pakistan has 10 recognized languages, with two official languages (Urdu and English), and is composed of six ethnic groups.⁷⁹ It is important to note that these languages are different from those of Afghanistan; therefore, a person could be working with any of 55 different languages when attempting to communicate with truck drivers arriving at the Afghanistan bases. Finding an interpreter that can speak the various languages to work with drivers is a challenge. Additionally, only 47.5% of male Afghans and 63% of Pakistan males are literate; resulting in the inability to provide drivers with written directions, government clearance documents, or instructions on how to process into or out of the bases in Afghanistan.^{80 81}

Time in the Arab culture is fluid and less rigid than the American view. For example, when you are told a truck is going to arrive at a base on Tuesday, it means that, God willing, the

⁷⁸ Jane's Information Group – Country Watch Review. *2008 Country Review Afghanistan*,” Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Afghanistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/afgha060.htm@current; Internet; accessed 7 January 2009. 1.

⁷⁹ Jane's Information Group – Country Watch Review. *2008 Country Review Pakistan*,” Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current; Internet; accessed 7 January 2009. 1.

⁸⁰ Jane's Information Group – Country Watch Review. *2008 Country Review Afghanistan*,” Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Afghanistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/afgha060.htm@current; Internet; accessed 7 January 2009. 146.

⁸¹ Central Intelligence Agency. *“The World Factbook – Pakistan”*; available from <https://www.cia.gov/library/publications/the-world-factbook/geos/pk.htm>; Internet; accessed 7 January 2009.

truck will arrive at the base on Tuesday and if it does not arrive it was not God's will.⁸² Time is an integral part of Western culture. Due to technical aspects of the language's verbs, which have no time structure, the concept of punctuality does not exist in the Arab culture.⁸³

The circumstances in Afghanistan are not unique to that country and will be inherent to future situations based on an uncertain enemy in an uncertain environment. The mission variables of literacy and time add to friction, but religion influences all aspects of life. “. . . Islam permeates the totality of life, that is in its normative function; in its psychological effect in providing a sustaining force; in its particular belief system; in its religiocentrism; and in the teleology or purposive orientation it gives to life.”⁸⁴ Therefore, religion adds a second chain-of-command, which at times is in conflict with other elements in the political, military, economic, social, and informational environment. Understanding this chain-of-command (COC) is a fundamental prerequisite for operating in an Islamic country.

FULL SPECTRUM OPERATIONS REQUIREMENTS

Full Spectrum Operations (FSO) is an Army term not used in JP 3-0 and 4-0. The closest equivalent term in the joint environment is Full-Spectrum Superiority. FM 3-0, *Operations*, defines FSO as “. . . forces combine offensive, defensive, and stability or civil support operations simultaneously as part of an interdependent joint force to seize, retain, and exploit the initiative, accepting prudent risk to create opportunities to achieve decisive results.”⁸⁵ JP 3-0, *Operations*, defines Full-Spectrum Superiority, as “the cumulative effect of dominance in the air, land, maritime, and space domains and information environment that permits the conduct of joint operations without effective opposition or prohibitive interference.”⁸⁶ Because the focus of support in Afghanistan was to ground forces, in particular the U.S. Army, the FM definition is

⁸² U.S. Army Training and Doctrine Command, Office of the Deputy Chief of Staff for Intelligence, *ARAB CULTURAL AWARENESS: 59 FACTSHEETS* (FORT LEAVENWORTH, KANSAS: January 2006).

⁸³ Raphael Patai, *The Arab Mind* (New York: Hatherleigh Press, 2002), 70-72.

⁸⁴ Raphael Patai, *The Arab Mind* (New York: Hatherleigh Press, 2002), 29.

⁸⁵ Joint Publication 3-0, *Joint Operations* (Washington D.C., 13 February 2008), 3-1.

⁸⁶ Joint Publication 3-0, *Joint Operations* (Washington D.C., 13 February 2008), V-13.

used. Given the multitude of tasks in FSO, logistics planners encounter competing, contradicting, and trade-off support when trying to cover all operations. The logistics planner is to consider "... all specified and implied requirements and be aware of resources available ..."⁸⁷ This goes back to what Jomini spoke about in his work on the principles of war, "... the voluminous treaties of the military analysts, all taken together, would hardly give even an incomplete sketch of what logistics is ..."⁸⁸ Offensive operations require anticipatory support as far forward as possible.⁸⁹ Defensive operations require varied support directly linked to the type of defense (static vs. mobile). The static defense requires high quantities of ammunition, but the mobile defense requires high quantities of fuel. Both require high demands on the transportation system to move material.⁹⁰ In stability operations, the logistics required are similar to the requirements of the offensive and defensive operations.⁹¹ The requirement to conduct all three of these missions simultaneously increases the tension and friction on each element of the system exponentially.

POLITICS AND ECONOMICS

A quick look at the Afghan government, its structures, the ensuing bureaucracy, and the interface between agencies reveals the need for an artful tongue and flexible back to adapt to constantly changing rules and requirements. It is at this point that systems of complex human networks and multiple cultures (U.S., Afghani, Pakistani) in public, private, political, social, and bureaucratic settings clash together. Importing or exporting cargo to Afghanistan through Pakistan requires coordination with three different governments (Afghanistan, Pakistan, and the United States) and numerous agencies, each with their own rules and requirements. Approval for

⁸⁷ Department of the Army Field Manual 4-0, *Combat Service Support* (Washington D.C., August 2003), 3-1.

⁸⁸ Antoine Henri Jomini, *The Art of War*, edited by Brigadier General J.D. Hittle as a part of *Roots of Strategy Book 2* (Pennsylvania: Stoackpole Books, 1987), 528.

⁸⁹ Department of the Army Field Manual 4-0, *Combat Service Support* (Washington D.C., August 2003), 3-1.

⁹⁰ Department of the Army Field Manual 4-0, *Combat Service Support* (Washington D.C., August 2003), 3-2.

⁹¹ Department of the Army Field Manual 4-0, *Combat Service Support* (Washington D.C., August 2003), 3-3.

import or export of cargo is caught up in a tedious paperwork process that takes between six and eleven days. For example, the paperwork process to export cargo from Afghanistan begins at the U.S. Embassy in Kabul. U.S. government agents obtain diplomatic clearance for cargo and prepare a diplomatic note that is hand-carried to various offices in the Afghanistan Ministry of Foreign Affairs and Finance (the Afghanistan government does not allow the use of email or fax for these documents and each piece of cargo requires its own document). The Ministry of Foreign Affairs renders approval or disapproval for movement of the commodity and the Financial Minister assesses any tariff and taxes. Once the Afghanistan government has completed its approvals, the Pakistan government allows faxing of the diplomatic note to their Ministry of the Interior. At the same time, the U.S. Embassy in Islamabad prepares a diplomatic note for the Pakistan Ministry of Foreign Affairs who in turn issues several documents: a letter of authority, an excise and taxation letter, a no objection certificate, and a delivery order. The export is not permitted until approval is received from all agencies. In addition, cargo being exported to the United States must meet United States Department of Agriculture (USDA) cleanliness standards which requires redeploying units to pressure wash and clean each piece of equipment prior to departing Afghanistan⁹². Once these requirements are met, the cargo is cleared for movement and begins a long, unsecure journey to the port of Karachi, Pakistan.

The security environment also directly affects the movement of cargo between the bases in Afghanistan to the port of Karachi, Pakistan. With clearances in hand, cargo departs strategic hubs in Afghanistan and travels unescorted (without military, civilian, or private security) on third party commercially contracted trucks to the port of Karachi, Pakistan. As Pakistan is a sovereign nation, it does not allow U.S. military convoys or escorts to travel within its borders. As stated earlier, there are only two travel routes for cargo. The southern route runs from the Port

⁹² Units in Afghanistan are confined to hand pressure washers and scrub brushes, unlike those stationed in Kuwait who can schedule the use of a wash rack.

of Karachi, Pakistan, going northwest to the Bolan Pass to the border crossing near the Pakistan city of Quetta and the northern route runs from the Port of Karachi, Pakistan, north to the Khyber Pass border crossing near the Pakistan city of Peshawar. These routes further restrict transport, as they require passage through the Pakistan tribal areas of the Northwest Frontier Province (NWFP) and the Federally Administered Tribal Area (FATA) of Khyber and South Waziristan respectively. Pakistan civil police and military must receive permission from their president or the tribes before entering these areas, creating a space of nation-state lawlessness that is a ripe climate for criminals and militants to destroy, damage, or pilfer the cargo.



Figure 3.6 Map of Pakistan

The Central Intelligence Agency, *The World Factbook - Pakistan*. Available from: <https://www.cia.gov/library/publications/the-world-factbook/geos/pk.html>. Accessed 26 January 2009.

Cargo destroyed, damaged, or pilfered during its journey becomes entangled in a mess of agreements, relationships, and law. Any attempt to recover cargo or receive monetary compensation is handled with the U.S. contracted ocean carriers. The carrier has a right to verify and investigate the claim and in-turn takes it up with their contracted truckers. The drivers are not independent contractors, but ultimately working for a tribe. Thus, the claim is taken to the appropriate tribe where a council of men called a jirga decides what, if anything will be done. The long bureaucratic paperwork process, an inability to protect cargo, and the limited ability to hold drivers directly responsible for the cargo movement, increases the friction.

The economic environment in Afghanistan is dismal; the people are extremely poor and lack the necessities of life (housing, clean water, electricity, medical care, jobs).⁹³ The average household income per year in 2006 was \$250.⁹⁴ The government of Afghanistan has been unable to project rule of law outside the major urban center of Kabul where 23% of the populations lives.⁹⁵ These conditions cultivate a climate of criminality and insecurity that has led to an orientation of working for whomever will provide pay for the day. This is true even for the national police. In addition, the government of Afghanistan is dependent on foreign aid and cannot currently support itself. These conditions directly contribute to the poor infrastructure conditions and security environment.

Considering all of the frictions and tensions in the areas of physical geography, infrastructure, culture, religion, FSO, politics, and economics discussed in this chapter, it is easy to see why it is impossible to effectively apply logistical science in Afghanistan. Rugged, mountainous terrain; limited infrastructure and highway points of entry and exit; and a lack of transportations modes, assets, and capacity combine to create tremendous friction that reduces the performance of the transportation system. In addition, multiple languages and the culture's view of time create barriers to understanding. Religion places itself as a second chain-of-command influencing all aspects of life. The strain to conduct FSO forces trade-offs in logistical support and responsiveness. Finally, politics and economics require adaptive engagements and understanding into the human terrain climate. These conditions together require 'art', since science cannot provide the framework to solve them.

⁹³ Jane's Information Group – Country Watch Review. *2008 Country Review Afghanistan*,” Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Afghanistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/afgha060.htm@current; Internet; accessed 7 January 2009. 131.

⁹⁴ United Nations Children's Fund (UNICEF), “Afghanistan”, available from http://www.unicef.org/infobycountry/afghanistan_statistics.html; Internet; accessed 7 January 2009.

⁹⁵ United Nations Children's Fund (UNICEF), “Afghanistan”, available from http://www.unicef.org/infobycountry/afghanistan_statistics.html, Internet; accessed 7 January 2009.

CHAPTER 4: APPLICATION OF ART IN THE CASE STUDY OF OPERATION ENDURING FREEDOM IV

Logistical science has engineered a machine without what could be referred to as ‘grease’. The machine operates well as long as friction does not interdict between the parts. However, in a place like Afghanistan, chance and uncertainty cause friction to build up and the machine can break down. In order to reduce the friction in the logistics machine, ‘grease’ or logistical art was needed. Logistical art reduced the friction and allowed the logistical machine to work within the environment. With the application of science failing because we could not just build an electrical or communications grid, miles of roads, or grow more trucks, a shift from logistical science methodologies and a look beyond science emerged. This emergence led to five artful applications to achieve solutions that overcame problems. This section will describe the artful applications (indirect power, negotiations, understanding, expectation management, and personalization of relationships) used in Afghanistan during March 2006 through February 2007. Before describing each of these, it is important to understand why the application of art was required over analytical or scientific approaches.

BACKGROUND

Upon arriving in theater, my expectation was to practice the age old equation of: determine requirements, compare to capabilities, overcome any shortfalls, and support the operation or as FM 4-0 states, “Using planning guidelines, planning factors, and established doctrine . . . [to] determine the quantities of supplies and services needed to support an operation.”⁹⁶ Having had training and experience in moving cargo around the world, from Alaska to Haiti and Europe to Iraq, the Army’s teaching was well engrained. In the world I knew, Army ships move cargo across the world; Army dockworkers work to load and unload the cargo at the seaports; Army transportation organizations, equipment, and personnel move the cargo across

⁹⁶ Department of the Army Field Manual 4-0, *Combat Service Support* (Washington D.C., August 2003), 5-6.

countries; and the Army's In-transit visibility (ITV) and Total Asset Visibility (TAV) tracking systems eliminate uncertainty by providing the real time status of cargo in the transportation system. First hand experience with cargo moving had given me the expectation that the Afghanistan Theater would employ these efficient and effective methods.

After arriving in Theater, I quickly realized that education, training, and experience had not prepared me for that strategic and operational environment. My preparation had started more than a decade before deploying: civilian education as an Industrial Engineer and the military education of the officer basic and advanced courses. I had a decade of experience which included leading soldiers as a platoon leader and company commander; various staff positions that schooled me in organizing, planning, and conducting deployments and redeployments; rotations through the Joint Readiness Training Center; deployments to various exercises throughout the Pacific Rim and South America; and a year Training With Industry with the FedEx Corporation in Memphis, Tennessee⁹⁷. The training, education, and experience in applying the logical model of logistical practice to problems were inadequate to overcome the circumstances in Afghanistan.

As I encountered numerous problems, I realized that the gap between what I knew and what I needed to understand was the result of a preparation emphasizing logistics as a science, a set of systemized truths, rules, and laws that could be verified through observation and induction. The set of doctrine, curriculum, and planning methods that I, as a logistician, had been schooled in and had practiced did not provide an adequate intellectual basis to frame, design, plan, and implement logistics in Afghanistan. The system template of circumstances, rules, and laws that I encountered in Afghanistan and Pakistan did not conform to our rationale.

⁹⁷ Training directly related to logistical modeling and how commercial industry works with the intent that lessons learned would allow better working relationships with commercial partners and contractors.

INDIRECT POWER

Indirect power in Afghanistan and Pakistan, as related to this case study, pertains to the culture of tradition, relationships, and a series of artful compromises. The culture of tradition contains kinship, loyalty, bravery, manliness, aversion to physical work, self-respect, and most of all honor or 'face'. Establishing relationships provided power to connect with the 'culture of tradition' and improve the overall performance of the GLOC. This process began by placing an SDDC person at each of the strategic locations where interaction was essential to the movement of cargo; the U.S. Embassies in Kabul and Islamabad and at each of the delivery locations in Bagram, Kandahar, and Salerno. These individuals integrated into the command structure and local authorities. Key to this integration was the establishment of face-to-face relationships with their Afghani/Pakistani counterparts. Arabic culture places a higher value on personal contact between people vice a contractual relationship of business.⁹⁸ With relationships established, particularly between SDDC representatives and Pakistan/Afghanistan ministers, honor was at stake for the Afghanistan/Pakistan individuals working in those offices. If bureaucracy held up cargo, the imperative of preserving one's honor or face came into question and provided motivation to work quickly to resolve any friction. These relationships also allowed integration into their approval system for cargo movement and cooperative policy building. An established relationship allowed communication and understanding of their processes, thereby allowing us to improve the science (or process) of moving cargo. This process could then be communicated and understood by all parties.

A series of artful compromises led to emergence of more availability and capacity of transportation assets. As a result of trusted relationships, and in cooperation with the trucking companies, terminals were established in Landi Kotal, a city just before the Khyber Pass on the Pakistan side. Terminals monitored the flow of trucks crossing into Afghanistan and allowed

⁹⁸ Raphael Patai, *The Arab Mind* (New York: Hatherleigh Press, 2002), 329.

trucks that could not pull their loads through the Khyber Pass to change out. This allowed us to tap into trucks with smaller engines for movement of cargo from the Port of Karachi to Landi Kotal or vice versa, ultimately increasing the number of assets as well as the capacity of the system to move material. Increased assets meant companies could recruit more owner-operators. Decreased over-the-road time and engine size requirements, coupled with the ability to keep drivers within their own country's borders, increased the number of trucks and drivers. We worked with ocean vessel carriers to match shipments as soon as the need was identified. This allowed pre-positioning of required container chassis, flatracks, and lowboy trailers to ensure efficient movement of material out of the Port of Karachi or bases in Afghanistan. Capacity limitations were addressed with forecasting and the establishment of new terminals. We forecasted heavy loads, large shipments, and unit rotations allowing companies time to prepare to meet our requests by adding additional drivers and trucks. This series of artful compromises built a mosaic of micro improvements that could not have been constructed as part of a single, scientific master plan, but allowed for market forces to emerge locally and then be expanded as they became successful.

NEGOTIATIONS

Negotiations were used to continue the GLOC system improvements. As might be expected, negotiations took place in the political environment. To gain government support for reducing loss, work was done to show the governments of Pakistan and Afghanistan that pilferage equated to losing revenue on untaxed goods going to market. The loss of tax revenue was a leverage point. The realization of the monetary loss associated with pilferage prompted the national police in both countries to address pilferage. Only the tribal areas of Khyber and South Waziristan, where police are denied entry, continued to be problematic. Art gained an understanding of where the leverage points were and set the stage for applying the art of negotiation.

As Lawrence Freedman describes in his book, *Deterrence*, for the starving people it was cheaper to resist the police than it was to comply with them.⁹⁹ If you have a gun, but nothing to eat, you go hunting and in Afghanistan you hunt cargo trucks not wild game. In addition to using the leverage point of revenue loss, the support from U.S. relief agencies in impoverished areas contributed to the reduction of the food or fight struggle. In fiscal year 2002 (the latest reporting year), the Department of Agriculture and USAID Food for Peace assisted Afghanistan with \$198.12 million for food commodities.¹⁰⁰ The art of seeing non-traditional cause-effect relationships was important. The science of economics and trade-off analysis looked only at the almighty dollar.

The security environment in the tribal areas where national police were denied access and the United States was denied projection of security, required negotiation. This was addressed at the U.S. Ambassador level. The United States cultural perspective was that the pilferage taking place in these areas was a criminal activity and must be completely stopped. However, the tribal perspective was that the cargo passing through was exchanging goods for use of their road and safe passage. The understanding of this tribal norm led to the establishment of a tolerance level or acceptable level of loss. Although the official level of loss is not available for publication, pilferage was less than 1% of the overall cargo shipped to Afghanistan. The paying of passage is similar to paying a toll to pass through their tribal area or a bribe to ensure safe passage. As long as cargo destruction, damage, and pilferage did not exceed this tolerance level, operations continued. If losses exceeded the tolerance level, we used the already established relationships to work the problem.

To further decrease the likelihood of pilferage, we worked to decrease the easy identification of cargo. Origin shipping depots began to use non-unique, unmarked containers.

⁹⁹ Lawrence Freedman, *Deterrence* (Massachusetts: Polity Press, 2004), 39.

¹⁰⁰ Kenneth Katzman, Afghanistan: Post War Governance, Security, and U.S. Policy. Congressional Research Service Report for Congress Washington D.C, September 2, 2008. Page CRS-56.

The Port of Karachi placed containers door-to-door, applied container seals, and worked to ensure containers appeared similar to containers common in Pakistan/Afghanistan.

SOCIAL NETWORKING

Patience was a virtue when it came to infrastructure. Since the fall of the Taliban, approximately 5,000 miles of road have been built¹⁰¹ and roads are a top U.S. priority consuming about 25% of the USAID spending since the fall of the Taliban.¹⁰² The focus of road development has been around the country's capital of Kabul, routes connecting Kabul and Kandahar, and routes connecting Kabul and Kandahar to Pakistan.¹⁰³ Roads not only provide the lifeblood for moving material for U.S. defense forces, but are also a key venue for the Afghan government to connect to its people and its people to connect to markets. By using the established roads and working with the command to understand our reliance on infrastructure, we were able to move cargo and manage expectations. The science of the logistics preparation of the Theater told us what and where roads existed, but the art allowed us to see the possible. Existing roads determined where the command delivered goods and where the command established four hubs in Afghanistan as locations in which cargo was brought to and from the Port of Karachi: Bagram, Kabul, Kandahar, and Salerno.

Tracking cargo was impossible; we desired a network of ITV interrogators to track cargo throughout Pakistan and Afghanistan. Pakistan's infrastructure made it feasible, but the government would not allow the use or installation of RFID technologies. Ongoing efforts were

¹⁰¹ Kenneth Katzman, *Afghanistan: Post War Governance, Security, and U.S. Policy* (Washington D.C.: Congressional Research Service Report for Congress, September 2, 2008), CRS-3.

¹⁰² Kenneth Katzman, *Afghanistan: Post War Governance, Security, and U.S. Policy* (Washington D.C.: Congressional Research Service Report for Congress, September 2, 2008), CRS-49.

¹⁰³ Jane's Information Group – Country Watch Review. *2008 Country Review Pakistan*,” Available from http://www4.janes.com.lumen.cgsccarl.com/subscribe/sentinel/SASS_doc_view.jsp?Sent_Country=Pakistan&Prod_Name=SASS&K2DocKey=/content1/janesdata/sent/sassu/pakis060.htm@current;Internet; accessed 7 January 2009.

made to obtain a ‘No Objection Certificate (NOC)’ to use RFID or satellite cargo tags.¹⁰⁴

Although never approved during my tour, Pakistani businesses were learning the value of such technology. Approval of a NOC would have been more likely and timely had the host nation trucking companies bought into the technology use and demanded its use within the country by the government.

In Afghanistan, the possibility of using in-transit visibility tracking (ITV) was not a government problem but an electrical network problem. Electricity is essential to providing necessary street lighting, communications, and ITV. The electrical network provides the architecture for building communications networks that allow people to conduct business outside the local market area. Without electricity, landline and cellular telephones, and computers in-transit visibility interrogators cannot exist. The cost benefit analysis of upgrading the entire infrastructure just to add ITV was not feasible. In addition to cost, installing this infrastructure would create another target of vulnerability for all future terror operations. The absence of cellular telephones, computers, and ITV devices makes it impossible for a driver to check in with his company or bases in Afghanistan, provide updates on his progress, or tell of a delay. It also tethers trucking companies to locations where they can access electricity or produce it on their own with enough security to prevent generator pilferage. The loss of communication leads to uncertainty regarding arrival of trucks. Currently only 15-20% of the population has access to electricity.¹⁰⁵

To overcome the lack of ITV, a social network was created. Working with the trucking companies, a social network of checkpoints was established along the routes where local villagers would manually record truck and container numbers as they passed. The truck and container numbers were then passed back daily to the trucking company headquarters and the company

¹⁰⁴ A No Objection Certificate is a letter issued by the appropriate authority of the government of Pakistan stating the government does not object to the use of a technology within their borders.

¹⁰⁵ Kenneth Katzman, *Afghanistan: Post War Governance, Security, and U.S. Policy* (Washington D.C.: Congressional Research Service Report for Congress, September 2, 2008), CRS-3.

transmitted the data to us via email in a Microsoft Excel worksheet. Our ITV system became a series of men standing at the edge of their villages hand jamming truck and container numbers onto paper and then phoning it back to their company headquarters. This method was obviously not 100% accurate, but it reduced the uncertainty enough to provide some predictability and in turn led to better planning. By using a local social network to manifest and call in the cargo status, the cost benefit became feasible, it provided jobs to the local population, and reinforced the existing social-business network. The decision-making that looked beyond a technological or automated system solution was art and could not have been conducted as a scientific decision making process. The solution was satisfying; it was a good enough solution with built in flexibility and manageable downside risk that would not be catastrophic if it failed.

UNDERSTANDING

It is important to note that when attempting to effect positive change in the operations in Afghanistan, an understanding of culture was critical and an earlier, clearer understanding would likely have effected greater change. Many of the frustrations experienced were a result of differing views of time and methods for managing conflict or differences of opinion. Cultural differences were more difficult to maneuver, but were best handled by developing an understanding, particularly of communication styles and concept of time. The culture is less rigid and the concept of punctuality does not exist. We worked with trucking companies to set a tolerance level for the number of days for a truck to move between the Port of Karachi and bases. This allowed flexibility in punctuality for the drivers and gave us a window of delivery. We then worked the science of stockage level in support of an artful design, an artful understanding of the real problem and realistically determining what could be managed and what had to be accepted. A commodity manager with the Sustainment Brigade determined the acceptable level of stockage based on projected operations, historical consumption data, and transit times provided. Delivery times were more rapid during the summer (May through October) and slowed during the winter

(November through April). Stockage levels were maintained at a predetermined level based on Days of Supply (DOS). This was built up heavily prior to November and then allowed to self adjust to a lower level by May.

Intermingled with the aforementioned challenges were differences in language. You cannot overcome the operational environment (i.e. farmers cannot change the weather, they can only adapt to it); you work within it to reduce the tension points. Language was an obvious barrier and I employed a translator that spoke six languages to ease communication difficulties with drivers. In addition, we worked with the trucking companies to develop a picture process (like a cartoon) of how the system worked. That was, in turn used to educate drivers that could not read so they were able to accomplish their task of delivering cargo. We made reporting easier for drivers by adding armbands to the left sleeve of our uniforms, a visual signal to drivers of who to report to outside the base. The armband was much like those worn by Military Police (MP), except it used the SDDC patch and Arabic writing.

Finally, understanding how the drivers operate helped codify the cargo movement process. Drivers only travel during daylight (due to the lack of road light, road conditions, and possible interdiction), stop during the night to sleep next to or under their truck, and find their meals from roadside carts along the way. Trucks going north to the Khyber Pass are not loaded to full capacity due to the steep climbs and road construction of the road that passes through the pass. Unlike the over-the-road drivers in America, trucks in Pakistan/Afghanistan do not have large sleeper cabs or creature comforts. They are a box on top of or behind an engine with a driver and passenger seat.

MANAGING EXPECTATIONS

Predictability and understanding were necessary to reduce friction related to the distribution of assets. The ITV process mentioned above provided information to bases receiving cargo (projected arrival at their gate). In addition, educating companies and drivers on the value

of time proved beneficial. They did not understand that limiting the number of days a truck is on the road allows faster turn around time and increases the number of loads and the profit. It was equally important for U.S. leadership to understand the second and third order effects of holding trucks at bases in Afghanistan. This came down to establishing face-to-face relationships with the Sustainment Brigade commodity managers, the J4, and the Deputy Commanding General for



Figure 4.1 Refrigerator trailers with generator sets waiting downloading in Afghanistan (Photo by Author)

were on trailers setting in Afghanistan waiting to be unloaded, the trucking companies had no generator sets to attach to refrigerator trailers (reefers) at the port and no reefers could leave the port. The result was over \$900,000 spent flying product into Kabul, Afghanistan, because of the lack of generator sets.

support. However, what really brought the leadership's understanding to a head was when the 2006 Thanksgiving Dinner was not going to have all of its components. For months we had been working to explain the significance of holding up trucks either inside or outside the base gates. Then in November 2006, because all the available generator sets

PERSONALIZING RELATIONSHIPS

The learning point was that science could not make value, professional, interpretive, and sense-making judgments. Work must be done within the culture. Culture cannot be circumvented or built around. Getting the people to be vested (communication, negotiation, appreciation art) in the process increased performance. In most cases, approaching problems indirectly or using a proxy resulted in larger improvements than trying to work the problem directly. Finally, how we view the system is not as important as how they view the system. Art

includes interpreting and ‘making sense’ of the system. We need this art to help us see problems that are workable within the context of the Theater. Since these human dimensions and cultural complexities are present in every possible theater, this case study of Afghanistan does not represent a unique example. The types of challenges encountered in Afghanistan will be part of all future engagements. This is particularly relevant, as our doctrine directs us to leverage commercial and allied assets as much as possible, most importantly in stability operations.

In summary, the application of art in Afghanistan encompassed the indirect power of negotiations, social networking, understanding, expectation management, and personalizing relationships. These applications allowed the emergence of possibilities not predictable by scientific approach. The energy from these “artistic” applications increased the capability, capacity, and responsiveness of the logistics system.

CONCLUSION

DOCTRINE REINFORCES LOGISTICS AS SCIENCE

Carl Von Clausewitz and Antoine Henri Jomini's observations and theories on warfare are incorporated into U.S. Army doctrine, military education, and professional development. However, today we omit their premise that logistics is both art and science. In doctrine, the perception that logistics is only a science is tied to the continuous use of definitions and descriptions of logistics as the 'science'. By defining and describing logistics as a science, logistical operations become heavily involved in quantitative computations of factual requirements, mechanical capabilities, and information. This had led to the development of computer based technologies to algorithmically calculate logistics. This in turn has oriented education, training, and management of logistics to a scientific process.

AFGHANISTAN CASE STUDY SHOWS THE VALUE OF ART IN LOGISTICS

The need for the combination of art and science as shown in the Afghanistan case study highlights a gap in our preparation for the future. Scientific application alone could not achieve sustainment without the artful application of knowledge about traditional cultural concepts of kinship, loyalty, bravery, manliness, aversion to physical work, self-respect, and most of all honor. In order to inject energy into the business system, the application of indirect power through relationships was required. This led to the delicate balance of artful compromises creating the emergence of increased transportation asset availability and capacity. The art understood where the leverage points were located so that the science of negotiation could be applied.

The science of the logistics preparation of the Theater told us what and where roads existed, but the art allowed us to see the possibilities that could be created by providing needed relief. Support from U.S. relief agencies in impoverished areas contributed to the reduction of the food or fight struggle and subsequently to safe transit of cargo. The social network of

checkpoints established along trucking routes energized the existing system and gained cooperation and positive interest in moving cargo among the populace. By using a local social network to manifest and call in the cargo status (local villagers recorded truck and container numbers as they passed through), the cost became feasible and jobs were created for the local population. The decision-making to look beyond a technological or automated system solution was art and could not have been conducted as a scientific decision making process.

Moving from the knowledge (science) that communication styles and the concept of time differed to a deeper appreciation for those differences provided for an artful compromise. A tolerance level for transit time of trucks to move between the Port of Karachi and bases emerged. This allowed flexibility in punctuality for the drivers and gave us a window of delivery. Science could not make value, professional, interpretive, and sense-making judgments; appreciation of the art of logistics allowed for creative work within the culture and yielded the necessary success. As FM 7-0, *Training for Full Spectrum Operations*, instructs, when a commander is developing his/her Core Mission Essential Task List (C-METL) it needs to include individual and collective tasks to incorporate artful thinking and application to problem solving.

THE HUMAN DIMENSION

“ . . . War, notwithstanding the inevitable changes in the purposes, ways, and means, will remain a savage clash of will”.¹⁰⁶ Human beings remain at the center of war. Therefore, the human dimension must be understood as we face the increasingly difficult operational dilemmas that will require the balanced art and science approach.¹⁰⁷ Our ability to understand and accept other human cultures, while maintaining a balance of morals, ethics, and good mental and physical health, will be the challenge. In Afghanistan, understanding how their language and concept of time were connected allowed for the creation of conditions resulting in greater

¹⁰⁶ Department of the Army Training and Doctrine Command, *The U.S. Army Concept for the Human Dimension in Full Spectrum Operations – 2015-2024* (Fort Monroe, Virginia: 11 June 2008), 1.

¹⁰⁷ Department of the Army Training and Doctrine Command, *The U.S. Army Concept for the Human Dimension in Full Spectrum Operations – 2015-2024* (Fort Monroe, Virginia: 11 June 2008), 21.

predictability, less friction, and increased performance. The question became not why does the individual or system behave the way it does, but what purpose does the manifestation of the behavior serve for the individual or system? What need, want, or desire is met by a behavior? What does the individual or system accomplish as a result of a particular behavior? Problems were solved and progress was made when alternatives that met the wants, needs, and desires of the local populace were offered and encouraged.

FUTURE LEADERS NEED

The future operational environment will exist as a “war among the people”. Successful operation in an era of persistent conflict will require a focus on the human dimension. Future leaders will need to be superior information managers, mitigators of uncertainty and change, releasers of authority to the lowest level of competence, and masters in an ability to build rapidly adaptive, cohesive, and high performing teams.¹⁰⁸ Development of such a leader requires a change in the current education model. Artful solutions will be appreciated and sought out by leaders only after art becomes as integral in education and training as science is currently. Schools such as the Command and General Staff School, the School of Advanced Military Studies, and the Theater Logistics Course are in a position to efficiently guide large numbers of students through the experience of discovering and applying art.

These schools currently educate students to view science as the foundation from which knowledge, skill, and experience lead to understanding, judgment, and wisdom. But what is the nature of the understanding, judgment, and wisdom achieved through study that focuses on mathematical manipulation of observable relationships between different forms of matter? An education based on mathematics and science provides the knowledge and skill that allow a logistician to handle the ordinary and with the benefit of experience a logistician will develop

¹⁰⁸ Department of the Army Training and Doctrine Command, *The U.S. Army Concept for the Human Dimension in Full Spectrum Operations – 2015-2024* (Fort Monroe, Virginia: 11 June 2008), ii, 7, 8, 9, and 10.

deeper understanding and judgment. Over time a logistician will develop abilities for exercising professional art in dealing with the unknown and the unexpected. Diagram 5.1 provides a side by side comparison of the emphasis in current education and training and the proposed goal. The current education emphasis, depicted in diagram 5.1.a, is first mathematics, then science;

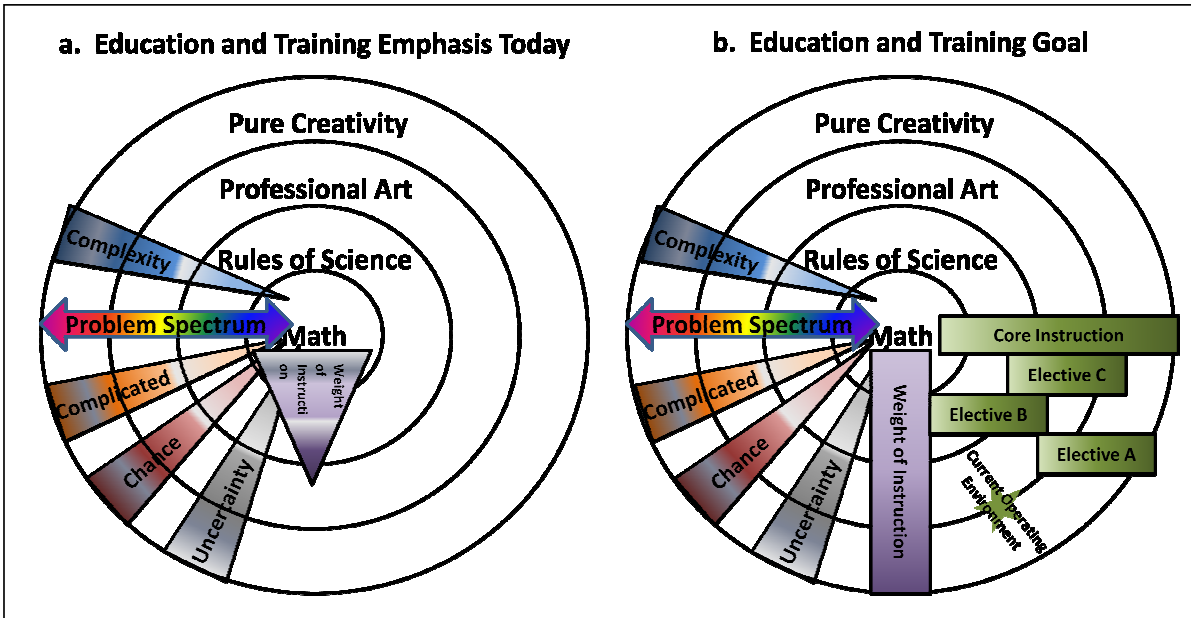


Diagram 5.1 Current and revised emphasis for logistics education and training

relatively little attention is given to professional art. The problem, as this study shows, is that to meet the requirements in Afghanistan and other similar areas of potential conflict Army logistics education needs to have a broader foundation. It must give greater attention to the exercise of professional art and the generation of creative solutions in complex human terrain. Such an education would develop a deeper level of understanding in officers allowing them to penetrate intuition and get below surface phenomena. It would also promote good judgment by giving them the wisdom to define the known and the unknown, expand the boundaries of what is possible, and realize what is impossible. More art (the combination of knowledge, understanding, judgment, and wisdom) in logistics education would help better prepare leaders to handle the

unexpected and unforeseen.¹⁰⁹ Diagram 5.1.b illustrates the content of a revised logistics education curriculum designed to meet the needs of FSO today; the key difference being equal emphasis in all areas in the Logistics Education Training Model (Mathematics, Rules of Science, Professional Art, and Pure Creativity). The core instruction would provide a foundation in each of the domains; electives in each domain would address individual requirements and give more detailed instruction for specific current operating environments. The Intermediate Level Education and Theater Logistics Course are two possible venues for implementation of this new model due to their ability to efficiently reach the most personnel.

SUMMARY

This monograph has presented evidence and analysis that suggest the Army can improve logistics operations through the acknowledgement of art and that logisticians need to look for artful solutions. I acknowledge we have been successful in the past, but current and future operating environments have new, harder challenges. These environments place logistics on a tipping point that can jeopardize mission accomplishment or commander's initiative. The threat to logistics is not always conventional, kinetic, or lethal. Logistical threats come from environmental, material, and personal arenas and include anything that can diminish logistical operations. Threats could be a port shutdown, trucker strike, government ministry closure, limitation on assets, limits of infrastructure, culture, concept of time, or national caveats. Threats that limit the logistics system responsiveness to the needs of the commander must be understood so they can be reduced, if not eliminated. Because the environment faced in Afghanistan is basically the same as the ones we will face in other areas during an age of persistent conflict, the study of logistics art, in all its complexities is no longer optional. The need for a logistical approach that extends beyond the boundaries of science is vital to our mission, our military, and our nation.

¹⁰⁹ The Holy See, Catechism of the Catholic Church (New York: Bantan Double Play Publishing Group, 1995) 502-503.

Beyond logistical tables, templates, and checklists are political, military, economic, social, informational, and infrastructure systems with people categorized as enemies, adversaries, supporters, and neutrals. These people are influenced by factors of geography, culture, religion, language, history, education, beliefs, perceived objectives and motivations, media, and personal experience. Learning to operate in different settings requires creativity, imagination, and innovation to come together. Creating an environment rich in understanding, knowledge, and value judgments will result in responsiveness, reduced uncertainty, and the ability of the commander to exploit opportunities. Leaders must critically think, collaborate, frame, design, plan, implement, continuously learn, and adapt logistical operations amidst ongoing change. Studying the U.S. Army's logistical experience in Afghanistan shows why these abilities are so important and why Army logistics education and training needs to be adjusted. Afghanistan operations have reminded us that logistics is art as well as science.

LIST OF ACRONYMNS

AY	Annual Year
CGSC	Command and General Staff College
CJTF	Combined Joint Task Force
C-METL	Core Mission Essential Task List
COC	Chain-of-Command
COE	Contemporary Operating Environment
CSS	Combat Service Support
DOD	Department of Defense
DOS	Days of Supply
FATA	Federally Administered Tribal Area
FM	Field Manual
FSO	Full Spectrum Operations
GATES	Global Air Transportation Execution System
GFM	Global Freight Management
GLOC	Ground Line of Communication
HNS	Host Nation Support
IBS	Integrated Booking System
ILE	Intermediate Level Education
ITV	In-Transit-Visibility
JIT	Just-In-Time
JP	Joint Publication
LEW	Logistics Estimation Workbook
LG	Logistics Corps
LG CCC	Combined Logistics Captains Career Course
MHE	Material Handling Equipment
MP	Military Police
MTMC	Military Traffic Management Command
NOC	No Objection Certificate
NWFP	Northwest Frontier Province
OEF	Operation Enduring Freedom
OPLOG	Operations Logistics Planner
PAT	Pipeline Asset Tool
REEFER	Refrigerator Trailer
RFID	Radio Frequency Identification Tag
SAMS	School of Advanced Military Studies
SDDC	Military Surface Deployment and Distribution Command
STAMIS	Standard Army Management Information Systems
TAV	Total Asset Visibility
U.S.	United States

USAID	United States Agency for International Development
USC05	Universal Services Contract version five
USDA	United States Department of Agriculture
USTRANSCOM	United States Transportation Command
VBIED	Vehicle Improvised Explosive Device
WPS	World Port System

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